MARINE DEBRIS SURVEY ANNUAL REPORT

CHANNEL ISLANDS NATIONAL PARK

1989

by

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ABSTRACT

Channel Islands National Park was one of eight National Park units participating in a five year marine debris survey for the National Marine Fisheries Service. Two surveys were conducted in 1989 on six beaches on Santa Rosa and San Miguel Islands. A total of 7,689 pieces of debris were found on the two surveys. More than twice as much debris was found on the winter (initial) survey as on the summer survey. Over 80 percent of the debris was plastic with foam fragments, plastic bottles, and hard plastic fragments being the most abundant items. Glass bottles and jars were the most abundant non-plastic items.

INTRODUCTION

The amount of litter found on beaches and out at sea over the last few years has become a national concern. Debris washed ashore diminishes the scenic value of beaches, and while adrift can endanger marine wildlife. Of particular concern is plastic debris which when discarded at sea can entangle and kill marine mammals, birds, fish, and sea turtles, disable ships, and aesthetically degrade beaches. According to results found in a 1975 United States National Academy of Sciences global survey, an estimated 6.4 million tons of litter is discarded in the world's ocean annually. That study found that most of the debris occurs in the northern hemisphere.

In the United States, a long term study has been conducted in Alaska by the National Marine Fisheries Service predominantly monitoring derelict fishing gear and entangling debris since 1972 (Merrell, 1984; Johnson and Merrell, 1988). For the remainder of the country, the problem of beach litter has been perceived as more of an aesthetic and health problem. Currently data on the types and volumes of debris on the non-Alaskan beaches of the nation are generated primarily from voluntary beach cleanups. While these data are useful for public education and media purposes, they are inadequate for quantitative assessment of the problem for developing solution strategies. These data are needed for each region of the country because the sources and effects of debris differ from area to area.

In an effort to learn more about the amounts and kinds of materials littering our beaches and evaluate long-term trends in ocean pollution, the National Park Service and the National Marine Fisheries Service have cooperated in a monitoring program of marine debris. Using the survey methods developed by the National Marine Fisheries Service, eight National Park Service units selected by region, are participating in the five-year program. Through quarterly surveys of established beach plots, this national survey system is gathering the data necessary to quantify the marine debris problems on continental U.S. shores.

Survey methods were the same for all beaches. A minimum of five one-kilometer sections of accessible shoreline that were not subject to cleaning, had minimal visitor impact, were representative of oceanic debris, and had uniform substrate and topography were surveyed in each park. The survey area extended from the waters edge to the seaward edge of vegetation. Debris visible from walking height was counted. When possible, debris was marked or removed from the beach at the end of each survey.

Eight National Park Service units in four areas are participating in the survey. The Pacific coast is represented by Olympic National Park in Washington and Channel Islands National Park in California. Padre Island National Seashore in Texas and Gulf Islands National Seashore in Mississippi and Florida represent the Gulf of Mexico. Cape Canaveral National Seashore in Florida and Cape Hatteras National Seashore in North Carolina represent the southern Atlantic coast. The northern Atlantic coast is represented by Cape Cod National Seashore in Massachusetts and Assateague Island National Seashore in Maryland and Virginia.

Channel Islands National Park

Channel Islands National Park is located in southern California off the coast of Ventura and Santa Barbara. The park islands are popular with recreational and commercial fishermen and boaters. The Santa Barbara Channel is a major shipping route for ships traveling between Los Angeles and ports to the north.

The Channel Islands have some of the most pristine beaches and harbor some of the richest wildlife concentrations in southern California. Marine debris affects both the aesthetics of the park and endangers the wildlife.

In June 1989, a workshop was attended by representatives of all participating parks. Standardized methods were agreed upon that clarified guidelines from the National Marine Fisheries Service. It was also decided that Channel Islands National Park would not conduct a summer survey because of breeding harbor seals and nesting snowy plovers on the beaches between March and July. In 1989,marine debris surveys were conducted at Channel Islands National Park in March (winter) and September (summer).

METHODS

Marine debris surveys were conducted at six beaches on Santa Rosa (4) and San Miguel (2) Islands (figure 1). Beaches-are surveyed only on these two islands because other islands failed to meet the criteria established for debris monitoring by the National Marine Fisheries Service or had access difficulty.

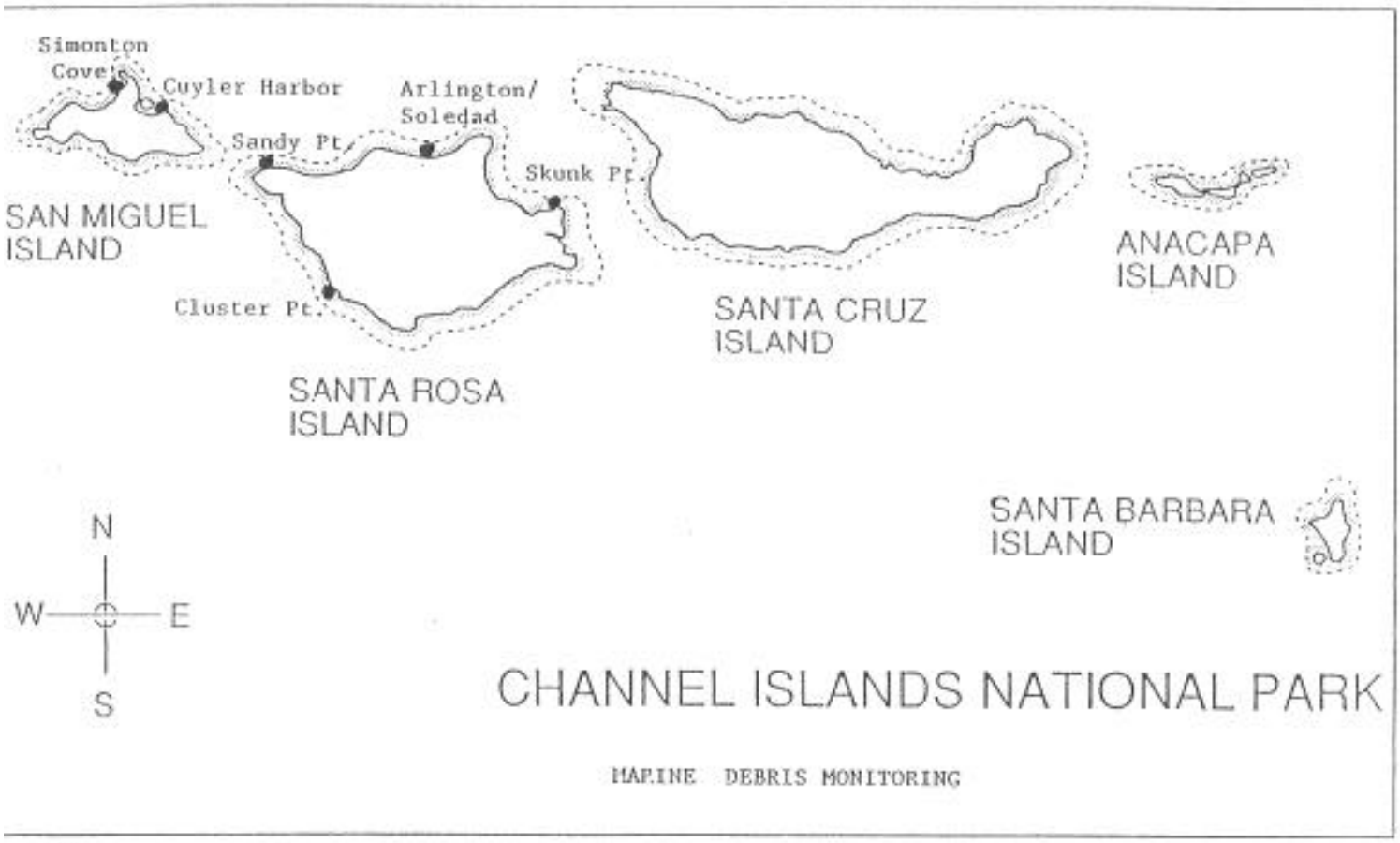

Figure 1. Marine debris monitoring sites at Channel Islands National Park.

On Santa Rosa Island, debris monitoring was conducted on beaches representing different exposures at Cluster Point, Arlington Canyon, Skunk Point, and Sandy Point. Cluster Point is a broad, flat dune-backed beach with southwest exposure. The beach we sampled stretches westward of Cluster Point. The beach at the mouth of Arlington Canyon is a narrow relatively steep dune-backed beach with a northern exposure. A perennial stream feeds a small lagoon at the west end of the beach. The beach at Skunk Point is a very broad, flat dune-backed beach with a northern exposure. At the east end of the survey area, the beach is over 50 m wide. The Sandy Point site is a shallow sloped beach backed by a low bluff that faces northwest and is fully exposed to the prevailing NW wind. Table I provides a summary of 4-h- -ii-e characteristics.

Table 1. Most common category of debris, exposure, and backing by site.

Site	Category	Exposure	Backing
Simonton Cove	Plas. frag/ foam	NW	Steep dunes
Sandy Point	Styrofoam pieces	NW	Low bluff
Skunk Point	Plastic bottles	N	Low dunes
Cluster Point	Plastic bottles	SW	Low dunes
Arlington Cyn.	Styrofoam/bottles	N	Dunes
Cuyler Harbor	Styrofoam	NE	Dunes and bluff

We surveyed sandy beaches at Cuyler's Harbor and Simonton Cove on San Miguel Island. The beach at Cuyler's Harbor faces northeast and is backed by short dunes at each end and by bluffs in the middle. At Simonton Cove, there is a long, wide beach backed by dunes, which is exposed to the northwest and to the prevailing winds.

All locations were surveyed in a similar manner. A team of three to six surveyors walked the beach collecting or counting all unnatural debris visible from a walking height. All plastic, metal, and glass debris was collected, classified, and counted in each of 10, 1QO meter segments of beach. A sample data sheet is attached (appendix 1).

The survey area for each beach included the intertidal zone between the water's edge and the upper limit of normal high tide, usually at the seaward limit of terrestrial vegetation. Debris was cleared from the surveyed area of all beaches and placed in the dunes above high tide. When possible, plastic pieces were taken off the island. At all sites styrofoam and,plastic fragments were cleared from the beach. Pieces too large to carry were marked with paint and left in place. Tar on the beach was noted as present or absent.

Items less -t-han one-half their original size were considered fragments. Ropes, netting, and buoys were measured and typed.

RESULTS

A total of 7,659 pieces of debris were found on the two surveys. The winter sample reflects the uncleaned nature of the beaches with 5,646 pieces total. Plastic debris (e.g. rope/line, bottles, caps, balloons, straws, toys, and fragments) and styrofoam (cups and pieces) accounted for 83 percent of the total number of debris pieces. The relative amounts of each major debris type are shown as percentages of the total debris in figure 2. Metal, cloth, wood, and paper debris combined comprised less than 20 percent of the total debris at all beaches. The relative amounts of plastic debris are shown in figure 3. The number of pieces of debris in the four categories of plastic debris are presented in table 2. The seasonal differences in relative percentages of those categories are shown graphically in figure 4.

Table 2. Numbers of pieces in major plastic debris categories at Channel Islands National Park.

	Fishing	Personal	Packaging	Miscellaneous
Winter	460	356	1830	2140
Spring	220	115	646	732

The ten most abundant plastic items from all beaches are shown as mean number of pieces per kilometer of beach in figure 5. Figures 6 and 7 show the 10 most abundant plastic items by season. Foam fragments were the most common category overall. This category included all foam pieces from broken styrofoam to fragments of foam insulation. Amounts of styrofoam varied among the survey beaches and was most abundant on beaches with northwest or northern exposure backed by bluffs or high dunes. Plastic bottles were very abundant on most beaches, especially Sandy Point and Simonton Cove. The number of plastic bottles declined at every beach after the first survey cleanup. Plastic bottles were usually beverage, dishsoap, or cleaning fluid (ie. bleach bottles) containers. Hard plastic fragments were also abundant on many beaches. Glass bottles and jars, light bulbs, paper pieces, and metal cans were the most abundant non-plastic items all ranking in the top 10 overall. Tar was found on every beach.

Rope was present on all beaches, but large amount only occurred on three. Rope was abundant on Cluster Point in March

CHANNEL ISLANDS NATIONAL PARK
% of Total Debris by Category

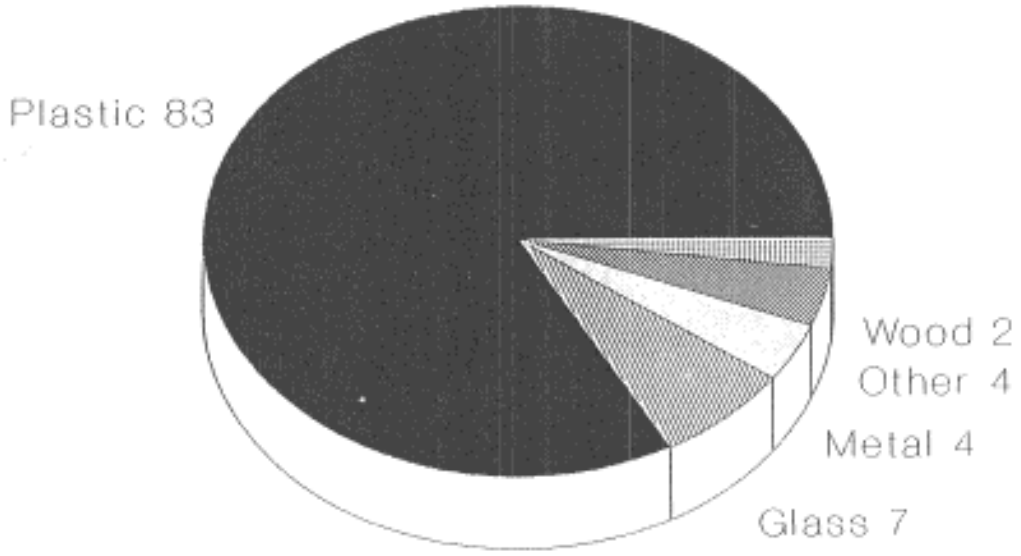

Figure 2. Relative abundance each major debris type recorded at Channel Islands National Park in 1989.

CHANNEL ISLANDS NATIONAL PARK
% of Plastic Debris by Category

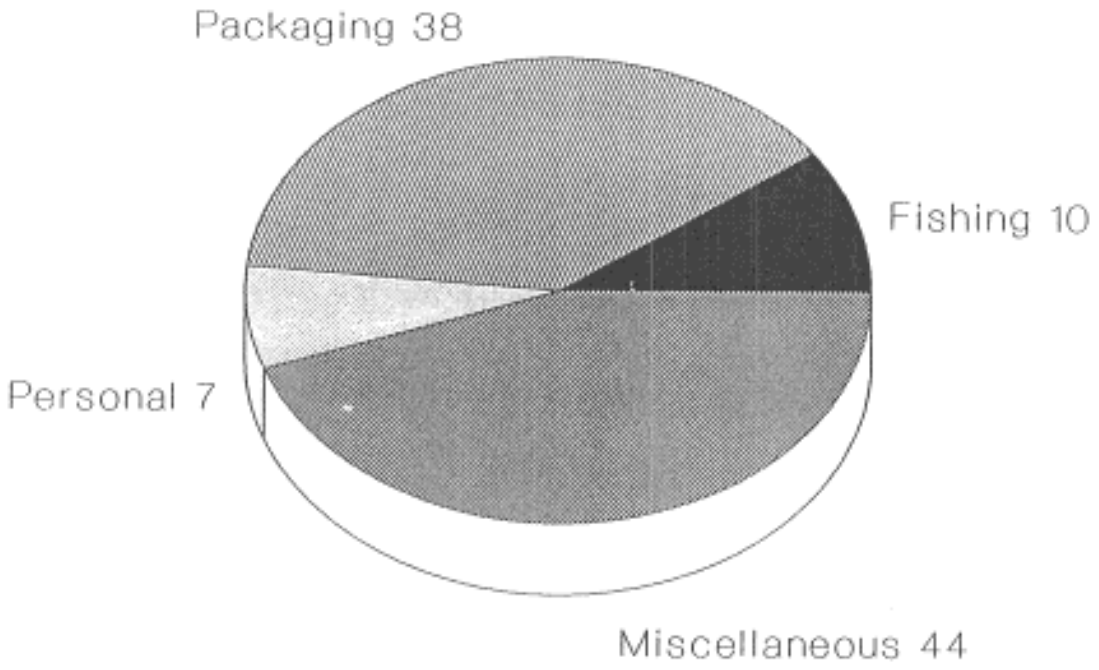

Figure 3. Relative amounts of the major categories of plastic debris from Channel Islands National Park in 1989.

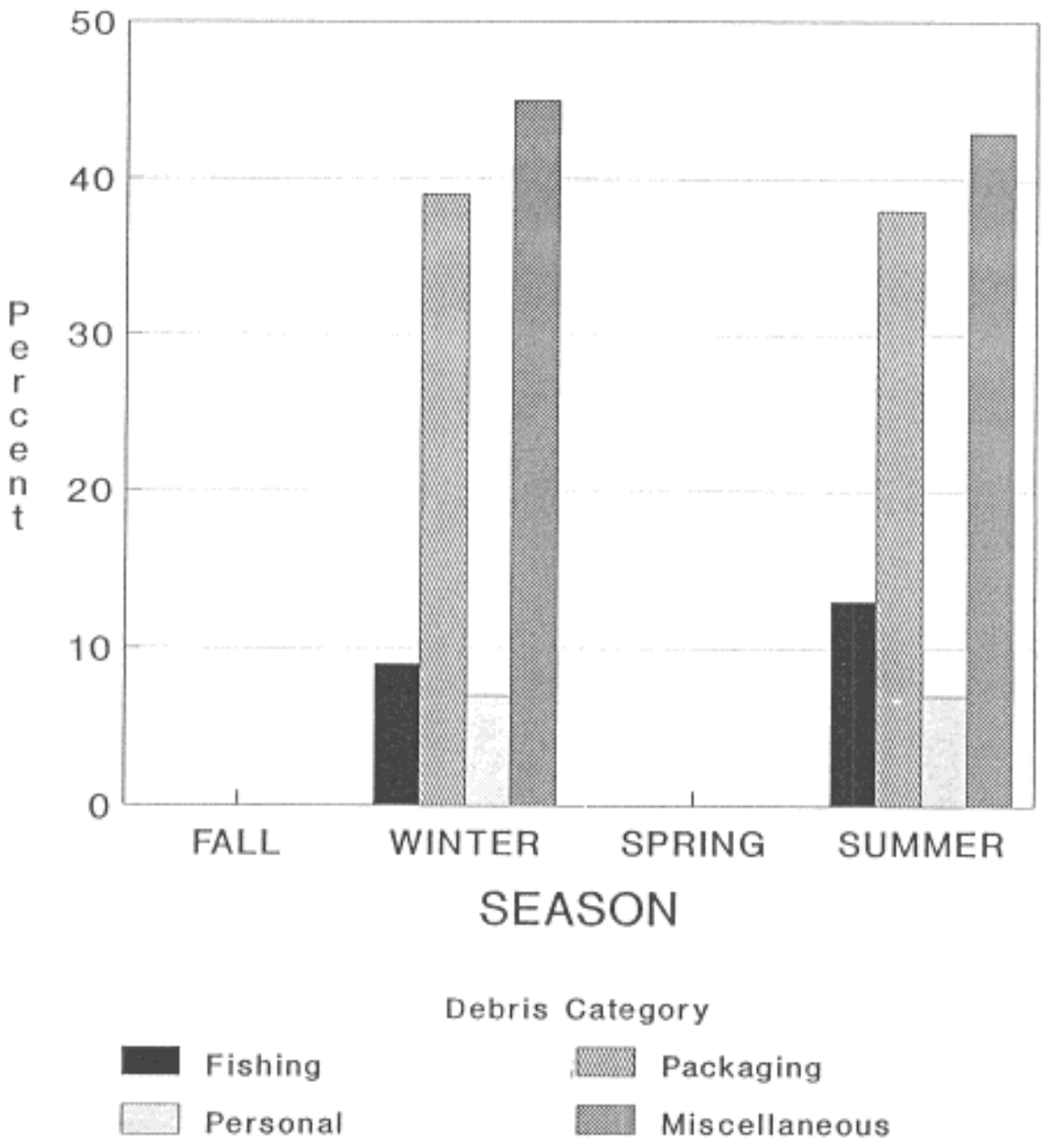

Figure 4. Relative amounts of plastic debris by season, 1989. (see table 2 for actual numbers)

CHANNEL ISLANDS NATIONAL PARK

10 Most Abundant Plastic Items

PLASTIC DEBRIS

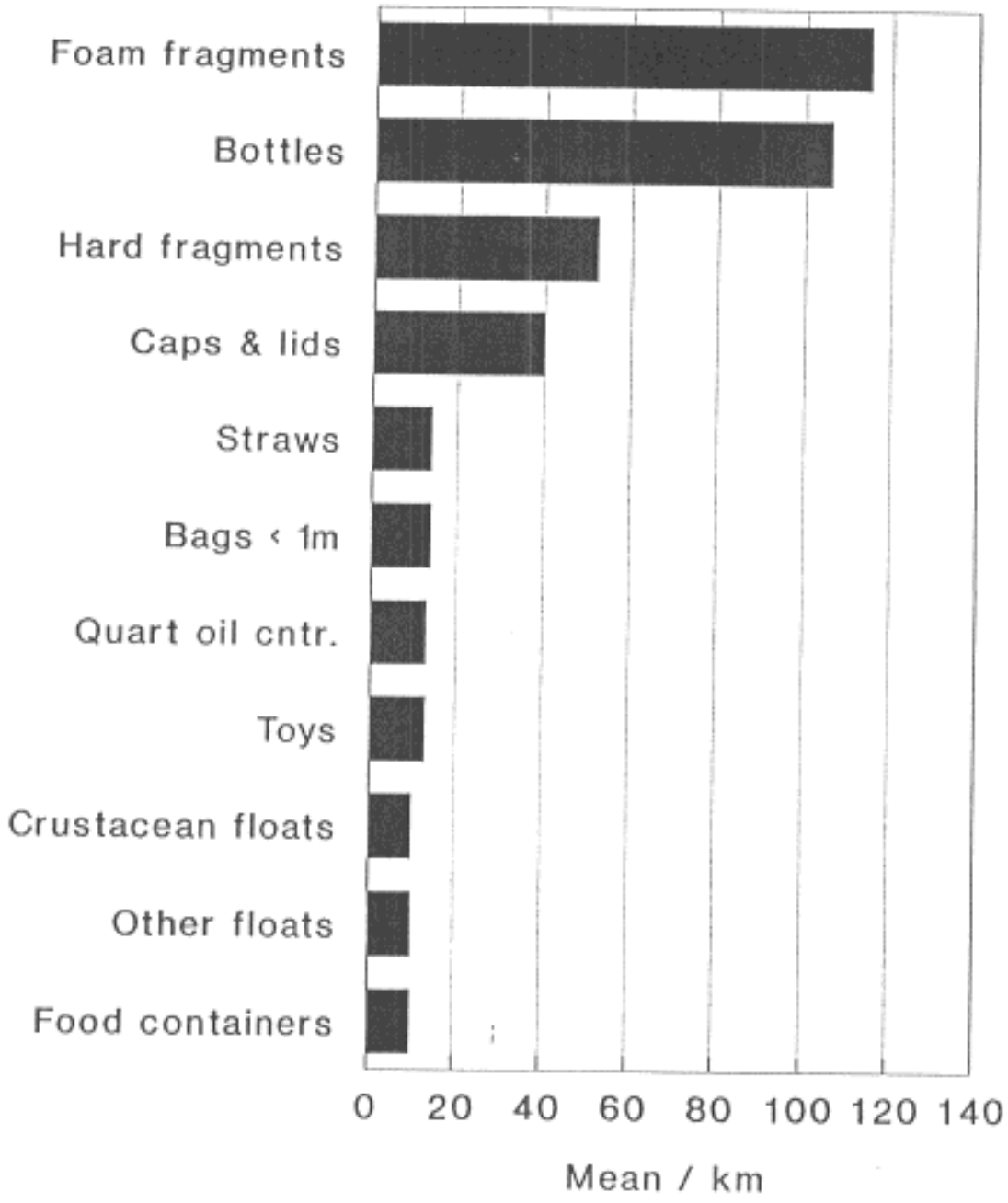

Figure 5. Ten most abundant plastic items in 1989 as mean number per kilometer.

CHANNEL ISLANDS NATIONAL PARK
10 Most Abundant Plastic Items-WINTER

PLASTIC DEBRIS

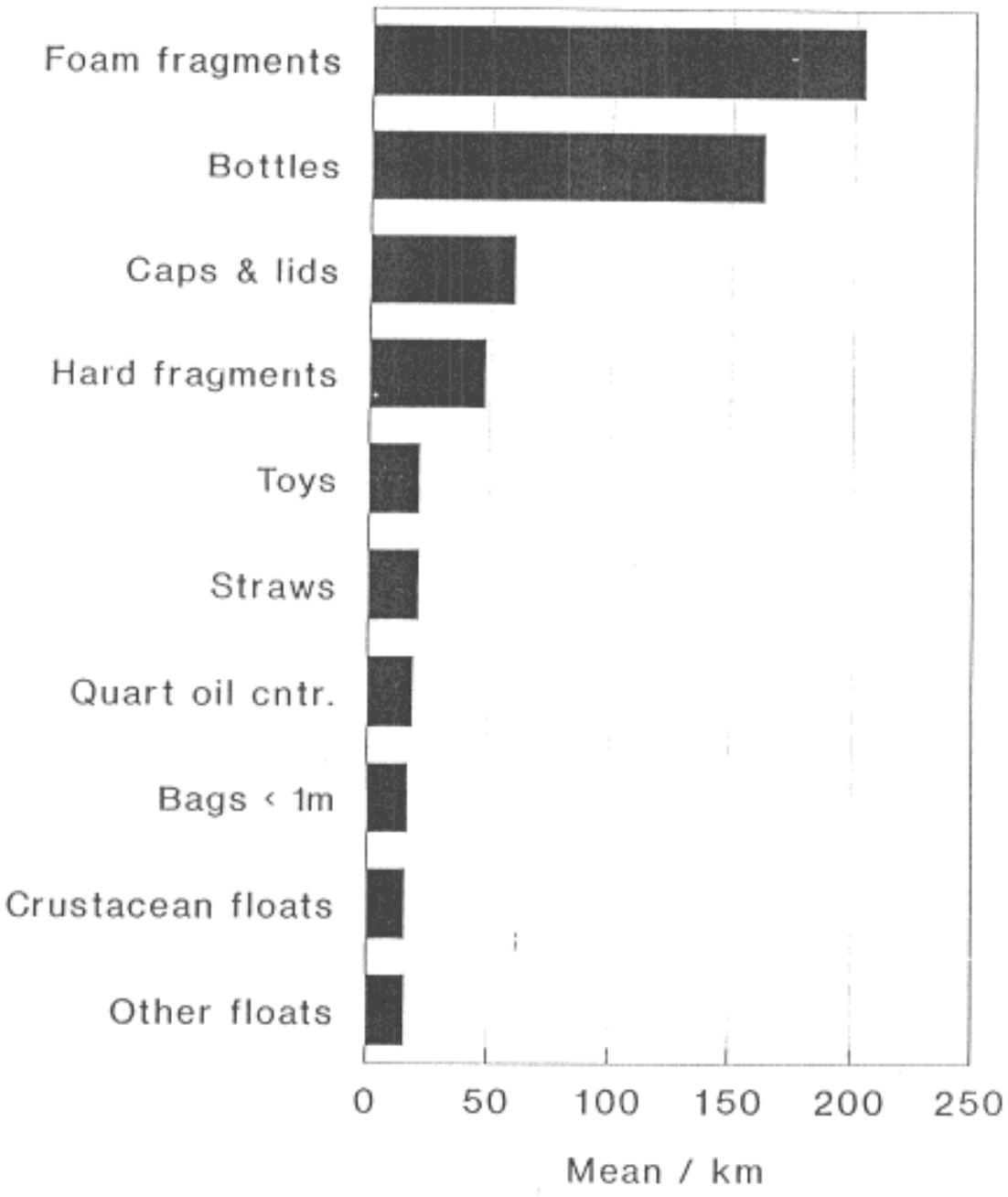

Figure 6. Ten most abundant plastic items in the winter survey, 1989 as mean number per kilometer.

CHANNEL ISLANDS NATIONAL PARK
10 Most Abundant Plastic Items-SUMMER

PLASTIC DEBRIS

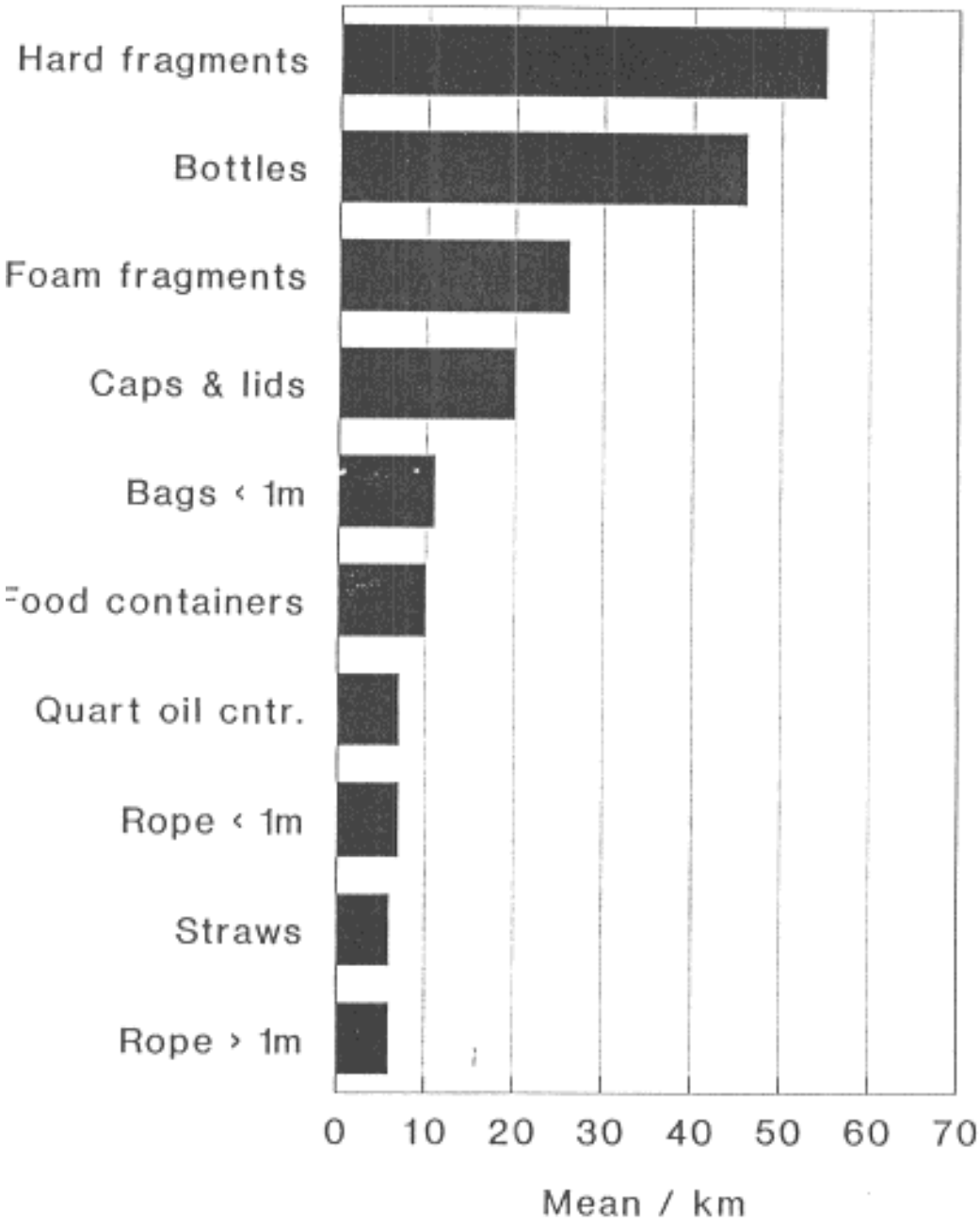

Figure 7. Ten most abundant plastic items in the summer survey, 1989 as mean number per kilometer.

with just over 200 meters, however only two meters of rope was present in September. At Sandy Point the number of pieces only increased slightly, between surveys, while the number of meters tripled (from 42 to 121). Approximately 237 meters of rope was removed from Simonton Cove in November during a preliminary survey. This would have doubled the amount of rope on the beach in the winter survey, but would not have changed the category ranking. Subsequent surveys have yielded over 200 m of rope on Simonton Cove beach despite previous removal. This indicates that accumulation is fairly constant. Simonton Cove had more rope than all the other park beaches combined. Individual pieces of rope ranged from less than one meter to approximately 40 m long. The majority of rope was about 10 mm in diameter and was often associated with crustacean trap buoys.

DISCUSSION

Beaches exposed to the prevailing northwest wind and current pattern in the northern Channel Islands, e.g. Simonton Cove and sandy Point, accumulated the largest amounts of debris. All of the beaches initially had a large accumulation of debris on the beach. On the longer beaches these rates will include longshore transport of debris from other parts of the beach as well as the input of new debris from various offshore sources.

It appeared that nearly all of the debris found on the rarely visited beaches of San Miguel and Santa Rosa Islands originated from offshore sources. The sources of the debris appeared to be litter from fishing and diving vessels, offshore oil rigs, and commercial shipping probably in that order of importance.

Simonton Cove had a very diverse accumulation of debris. Hard hats and life preservers with platform and oil company names indicate that some of the debris ca6 from oil platforms in the Santa Maria Basin or off Point Conception. Fishing gear; including ropes, buoys, floats, nets, and other pieces could have originated either locally or up the coast. Quart oil containers and floats were the most conspicuous items associated with the fishing industry. Simonton Cove also had a large number of light bulbs and fluorescent tubes. These and most of the construction materials found probably originated from commercial shipping or from oil platforms. Many plastic and glass bottles had foreign writing on them, usually Japanese or Korean, however Mexican and European products were also found.

Plastic packaging was the most abundant debris category on all the beaches. Much of this (e.g. bottles, food containers, styrofoam cups, and small plastic bags) could be considered galley waste either deliberately or accidentally jettisoned from fishing or commercial vessels or from oil rigs. It was

interesting how ubiquitous drinking straws were. The straws even seemed well distributed along each beach. Balloons, both latex and mylar were found at every beach as were other toys, especially tennis balls. Over 100 balloons were collected on the two surveys.

Considering the probable sources, we were surprised at the number of toys found. Footwear was another odd category that was more common than we suspected. Besides-sandals and wetsuit booties, we found high heels, cowboy boots, basketball shoes and other "non-marine" footwear. The presence of some of these items may indicate that debris from other beaches was carried out to the Channel Islands by the currents.

Hazardous waste and medical debris were uncommon on all beaches. Full five-gallon oil containers were found as were smaller containers of unknown chemicals. Two Syringes and a full IV bag of Ringer's Lactate Solution were found during the surveys.

since the size of individual pieces of debris varied greatly, the volume of debris was not correlated to the number of pieces. Styrofoam and plastic fragments were a particular problem in the surveys because of their abundance and size. Pieces ranged in size from approximately one centimeter to over one meter. Plastic fragments were usually small pieces of broken plastic or parts of something that did not fit in any other category. Styrofoam pieces were usually packing ("peanuts") material or fragments from styrofoam cups or floatation. Sandy Point beach with a northwest exposure and moderate bluff backing the beach caught a large amount of styrofoam. Simonton Cove beach would potentially have as much except small pieces probably were blown over the dunes by wind.

Except for ropes, mainly trap float lines, entangling debris was not that common on most beaches. NMFS personnel are conducting entanglement surveys on the islands as part of the pinniped monitoring; this data was unavailable at the time. From other observations, it would seem that debris entanglement affects only ~i small percentage of the population.

Entangling debris is a major concern around marine mammals. San Miguel Island is a major haulout and breeding rookery for pinnipeds. Elephant seals, harbor seals, and California sea lions utilize beaches year around. Elephant seals breed in December and January on most of the island's beaches. Harbor seals are extremely sensitive to disturbance, especially during pupping which generally occurs between February and April. Harbor seals also breed and haulout on Santa Rosa Island. Sea lions breed around June but are usually not in conflict with the monitored beaches.

Snowy plovers are an endangered specios that nest on the island beaches among the wrack. Plover nesting season begins in March and may last until July. Since plovers use debris as well as drift algae piles for orientation and protection from the wind, debris surveys are potentially very impacting to these tiny cryptic birds. For this reason second quarter (spring) surveys were not conducted in 1989.

Because harbor seals and elephant seals use the beaches on the Cardwell Point and on the south side of San Miguel Island, and since snowy plovers nest on those beaches, we decided not to monitor the debris on those beaches. From our observations it appears that there was not much debris on those beaches.

The beaches of Channel Islands National Park are characterized by low human visitation and high use by marine mammals and shore birds. Debris was generally transported and sorted by water and wind on the survey beaches and was subject to a minimum of direct human sorting and deposition. The timing and locations of debris surveys need to be carefully chosen to minimize disturbance to mammals and birds. More emphasis could be placed on the description of debris types which were most abundant in the initial surveys (e.g. plastics) to help identify the major sources of debris. An estimate of debris amount which included both the number of pieces and their relative size or volume would assist in the interpretation of survey results. The use of additional personnel in the surveys would facilitate the collection and clearing of debris. Subsequent surveys will allow estimates of the rate of recruitment of debris from proposed debris sources as well as from excavation and longshore transport of previously deposited debris.

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